Claims

1. Frequency tracking device (FTD) for a receiver (RC) of
    a multi-carrier communication system (MC-SYS), for
    evaluating and correcting frequency deviations (f_{off})
    which are introduced into multi-carrier symbols when
    being transmitted between a transmitter multi-carrier
    filter bank (4; IFFT) and receiver multi-carrier
    filter bank (8; FFT), comprising:

    a) a selector (SEL) adapted to receive a set of N
        complex data symbols output by the receiver
        multi-carrier filter bank (8; FFT) and N channel
        coefficients (C_{est}) corresponding to each sub-
        carrier as estimated by a channel estimator (12)
        of said receiver (RC), where N is the number of
        used sub-carriers in the multi-carrier system
        (MC-SYS), and adapted to select, on the basis of
        the N channel coefficients (C_{est}), a number M of
        sub-carriers corresponding to the M channel
        coefficients (C_{est}) having the largest absolute
        values, where M≤N;

    b) an evaluator (EVAL) adapted to determine, on the
        basis of the M selected sub-carriers and their
        corresponding M channel coefficients (C_{est}), an
        estimate ($f_{off,est}$) of the frequency deviation (f_{off})
        introduced into the multi-carrier symbols; and

    c) a corrector (CORR1; CORR2) for correcting the
        frequency deviation introduced into the multi-

carrier symbols on the basis of the determined
frequency deviation estimate ($f_{off,est}$).

2. Frequency tracking device (FTD) according to claim 1,
    wherein
    said selector (SEL) adaptively adjusts the number M at
    adjustment time intervals including at least one
    multi-carrier symbol duration.

3. Frequency tracking device (FTD) according to claim 1,
    wherein
    said corrector (CORR1; CORR2) includes a first
    correction unit (CORR1) arranged upstream the receiver
    multi-carrier filter bank (8) and adapted to rotate
    each received multi-carrier symbol with a different
    phase shift depending on the frequency deviation
    estimate ($f_{off,est}$) and the sample index (k) within the
    multi-carrier symbol.

4. Frequency tracking device (FTD) according to claim 1
    or 3, wherein
    said corrector (CORR1; CORR2) includes a second
    correction unit (CORR2) arranged downstream of the
    receiver multi-carrier filter bank (8) and adapted to
    rotate all data symbols output by the receiver multi-
    carrier filter bank (8) with the same phase shift
    depending on the frequency deviation estimate ($f_{off,est}$).

5. Frequency tracking device (FTD) according to claim 4,
    wherein

said second correction unit (CORR2) performs a
correction of the same set of N data symbols which are
subjected to the selection by said selector (SEL).

6.   Frequency tracking device (FTD) according to claim 1,
     wherein
     said corrector (CORR1; CORR2) includes:

     a first correction unit (CORR1) arranged upstream the
     receiver multi-carrier filter bank (8) and adapted to
     rotate each received multi-carrier symbol with a
     different phase shift depending on the frequency
     deviation estimate ($f_{off,est}$) and the sample index (k)
     within the multi-carrier symbol; and

     a second correction unit (CORR2) arranged downstream
     of the receiver multi-carrier filter bank (8) and
     adapted to rotate all data symbols output by the
     multi-carrier filter bank (8) with the same phase
     shift depending on the frequency deviation estimate
     ($f_{off,est}$).

7.   Frequency tracking device (FTD) according to claim 1,
     wherein
     said evaluator (EVAL) is adapted to carry out a
     decision directed evaluation for said M sub-carriers.

8.   Frequency tracking device (FTD) according to claim 1,
     wherein
     said evaluator (EVAL) is adapted to carry out a pilot
     carrier aided evaluation for said M sub-carriers.

9. Frequency tracking device (FTD) according to claim 1, wherein
said evaluator (EVAL) is adapted to carry out a combination of a decision directed evaluation and a pilot carrier aided evaluation for said M subcarriers.

10. Frequency tracking device (FTD) according to claim 1, wherein
the number of selected sub-carriers is M=N/4 to M=N/3 where N is the number of used subcarriers.

11. Frequency tracking device (FTD) for a receiver (RC) of a multi-carrier communication system (MC-SYS), for evaluating and correcting frequency deviations (f_{off}) which are introduced into multi-carrier symbols when being transmitted between a transmitter multi-carrier filter bank (4; IFFT) and receiver multi-carrier filter bank (8; FFT), comprising:

a) an evaluator (EVAL) adapted to receive a set of N complex data symbols output by the receiver multi-carrier filter bank (8; FFT) and N channel coefficients (C_{est}) corresponding to each sub-carrier as estimated by a channel estimator (12) of said receiver (RC), where N is the number of used sub-carriers in the multi-carrier system (MCSYS), and to determine, on the basis of N sub-carriers and their corresponding N channel coefficients (C_{est}), an estimate ($f_{off,est}$) of the frequency deviation (f_{off}) introduced into the multi-carrier symbols, where N is the number of sub-carriers used in the transmitter;

b) a corrector (CORR1; CORR2) for correcting the frequency deviation introduced into the multi-carrier symbols on the basis of the determined frequency deviation estimate ($f_{off,est}$); and

c) wherein said corrector (CORR1; CORR2) comprises a corrector unit (CORR2) arranged downstream of the receiver multi-carrier filter bank (8) and adapted to rotate all data symbols output by the receiver multi-carrier filter bank (8) with the same phase shift depending on the frequency deviation estimate ($f_{off,est}$).

12. Frequency tracking device (FTD) according to claim 11, wherein

said corrector (CORR1; CORR2) further includes a correction unit (CORR1) arranged upstream the receiver multi-carrier filter bank (8) and adapted to rotate each received multi-carrier symbol with a different phase shift depending on the frequency deviation estimate ($f_{off,est}$) and the sample index (k) within the multi-carrier symbol.

13. Frequency tracking device (FTD) according to claim 11, further comprising

a selector (SEL) adapted to receive a set of N complex data symbols output by the receiver multi-carrier filter bank (8; FFT) and N channel coefficients (C_{est}) corresponding to each sub-carrier as estimated by a channel estimator (12) of said receiver (RC), where N is the number of used sub-carriers in the multi-carrier system (MCSYS), and adapted to select, on the

basis of the N channel coefficients (C_{est}), a number M of sub-carriers corresponding to the M channel coefficients (C_{est}) having the largest absolute values, where M≤N; and wherein

said evaluator (EVAL) is adapted to determine, on the basis of the M selected sub-carriers and their corresponding M channel coefficients (C_{est}), an estimate ($f_{off,est}$) of the frequency deviation (f_{off}) introduced into the multi-carrier symbols.

14. Receiver (RC) of a multi-carrier communication system (MC-SYS), comprising reception means (RM) for receiving multi-carrier symbols transmitted from a transmitter (TR) via a transmission channel (6), a receiver multi-carrier filter bank (8) for converting said multi-carrier symbols into complex data symbols, a data symbol sink (11) for receiving said data symbols and a frequency tracking device (FTD) in accordance with one or more of claims 1-10 or one or more of claims 11-13.

15. A multi-carrier communication system (MC-SYS), comprising at least one transmitter (TR) including a data symbol source (1-3) generating complex data symbols, a transmitter multi-carrier filter bank (4) for generating multi-carrier symbols from said complex data symbols and a transmission means (TR) for transmitting said multi-carrier symbols onto a transmission channel (6), and at least one receiver (RC) in accordance with claim 14.

16. A method for evaluating and correcting frequency
deviations (f_{off}) which are introduced into multi-
carrier symbols when being transmitted between a
transmitter multi-carrier filter bank (4; IFFT) and
receiver multi-carrier filter bank (8; FFT),
comprising the steps of:

a) determining (S1; S2), in a receiver (RC) of a
multi-carrier communication system (MC-SYS), a
set of N complex data symbols output by the
receiver multi-carrier filter bank (8; FFT) and N
channel coefficients (C_{est}) corresponding to each
sub-carrier as estimated by a channel estimator
(12) of said receiver (RC), where N is the number
of used sub-carriers in the multi-carrier system
(MCSYS); and

b) selecting (S3), on the basis of the N channel
coefficients (C_{est}), a number M of sub-carriers
corresponding to the M channel coefficients (C_{est})
having the largest absolute values, where M≤N;

c) determining (S4), on the basis of the M selected
sub-carriers and their corresponding M channel
coefficients (C_{est}), an estimate ($f_{off,est}$) of the
frequency deviation (f_{off}) introduced into the
multi-carrier symbols; and

d) correcting (S5) the frequency deviation
introduced into the multi-carrier symbols on the
basis of the determined frequency deviation
estimate ($f_{off,est}$).

17. A method according to claim 16,
    wherein
    said correction step (S5) includes a first correction
    (CORR1) carried out upstream a receiver multi-carrier
    filter bank (8) in which each received multi-carrier
    symbol is rotated with a different phase shift
    depending on the frequency deviation estimate ($f_{off,est}$)
    and the sample index (k) within the multi-carrier
    symbol.

18. A method according to claim 16,
    wherein
    said correction step (S5) includes a second correction
    (CORR2) carried out downstream a receiver multi-
    carrier filter bank (8) in which all data symbols
    output by the receiver multi-carrier filter bank (8)
    are corrected with the same phase shift depending on
    the frequency deviation estimate ($f_{off,est}$).

19. A method according to claim 16,
    wherein
    said correction step (S4) includes:

    a first correction (CORR1) carried out upstream a
    receiver multi-carrier filter bank (8) in which each
    received multi-carrier symbol is rotated with a
    different phase shift depending on the frequency
    deviation estimate ($f_{off,est}$) and the sample index (k)
    within the multi-carrier symbol; and

    a second correction (CORR2) carried out downstream a
    receiver multi-carrier filter bank (8) in which all

data symbols output by the receiver multi-carrier
filter bank (8) are corrected with the same phase
shift depending on the frequency deviation estimate
($f_{off,est}$).

20. A method for evaluating and correcting frequency
deviations (f_{off}) which are introduced into multi-
carrier symbols when being transmitted between a
transmitter multi-carrier filter bank (4; IFFT) and
receiver multi-carrier filter bank (8; FFT),
comprising the steps of:

a) determining (S1', S2'), in a receiver (RC) of a
multi-carrier communication system (MC-SYS), a
set of N complex data symbols output by the
receiver multi-carrier filter bank (8; FFT) and N
channel coefficients (C_{est}) corresponding to each
sub-carrier as estimated by a channel estimator
(12) of said receiver (RC), where N is the number
of used sub-carriers in the multi-carrier system
(MCSYS), and

b) determining (S3'; S4'), on the basis of N sub-
carriers and their corresponding N channel
coefficients (C_{est}), an estimate ($f_{off,est}$) of the
frequency deviation (f_{off}) introduced into the
multi-carrier symbols, where N is the number of
sub-carriers used in the transmitter; and

c) correcting (S5') the frequency deviation (f_{off})
introduced into the multi-carrier symbols on the

basis of the determined frequency deviation
estimate ($f_{off,est}$); and

c)   wherein said correction step (S3') comprises a
       correction (CORR2) carried out downstream of the
       receiver multi-carrier filter bank (8) in which
       all data symbols output by the receiver multi-
       carrier filter bank (8) are rotated with the same
       phase shift depending on the frequency deviation
       estimate ($f_{off,est}$).

21. A method according to claim 20,
     wherein
     said correction step (S5') further includes a
     correction step (CORR1) carried out upstream the
     receiver multi-carrier filter bank (8) in which each
     received multi-carrier symbol is rotated with a
     different phase shift depending on the frequency
     deviation estimate ($f_{off,est}$) and the sample index (k)
     within the multi-carrier symbol.

22. A method according to claim 20,
     further including the steps of.
     selecting (S2'), on the basis of the N channel
     coefficients (C_{est}), a number M of sub-carriers
     corresponding to the M channel coefficients (C_{est})
     having the largest absolute values, where M≤N; and
     wherein

     determining (S4'), on the basis of the M selected sub-
     carriers and their corresponding M channel
     coefficients (C_{est}), an estimate ($f_{off,est}$) of the

frequency deviation (f_{off}) introduced into the multi-carrier symbols.